WHAT IS CLAIMED IS:

1. A cartridge for housing a flow through device, comprising:

a flow through device having a first side, a second side, and an array of microchannel passages extending through the first and second sides; and

a chip holder for holding the flow through device, the chip holder comprising:

a body with a support that supports the flow though device;

a flow surface formed within the body, the flow surface facing the first side;

a test fluid chamber defined at least by the flow surface and the first side, and configured to produce a substantially uniform flow of a test fluid mixture through the microchannel passages; and

a first port communicating with the test fluid chamber for passing the test fluid mixture into the test fluid chamber.

2. The cartridge of claim 1, further including a base for supporting the chip holder.

3. The cartridge of claim 1, wherein the flow surface is angled.

4. The cartridge of claim 1, wherein the flow surface includes a trench that is sloped relative to the first side, from a first portion to a second portion of the flow surface, to provide a greater spacing at the first portion than at the second portion from the first side.

5. The cartridge of claim 4, wherein the first port is formed at the first portion and the trench has a slope of about 1° to about 4° relative to the first side.

6. The cartridge of claim 5, wherein the slope is about 2.55° relative to the first side.

7. The cartridge of claim 1, wherein the body has a second port for draining the test fluid mixture that has passed through the flow through device.

8. The cartridge of claim 1, further including a first seal contacting the first side to prevent leakage of the test fluid in the test fluid chamber.

9. The cartridge of claim 8, wherein the first seal contacts a perimeter region of the flow through device on the first side to direct flow of the test fluid mixture though the flow through device and to prevent leakage of the test fluid mixture around the flow through device.

10. The cartridge of claim 1, further including first and second seals in contact with perimeter regions of the first and second sides of the flow through device to prevent leakage of the test fluid mixture.

11. The cartridge of claim 10, wherein the second seal has a channel to direct a flow of the test fluid mixture to the second port.

12. The cartridge of claim 10, wherein the first and second seals are made of Viton rubber.

13. The cartridge of claim 8, wherein the support comprises a first shelf disposed around the flow surface, and the seal is sandwiched between the first side and the first shelf.

14. The cartridge of claim 1, further including an observation window, which is supported on the body for viewing the second side of the flow through device.

15. The cartridge of claim 14, wherein the body has a second shelf disposed around the first shelf, the observation window being seated over the second shelf.

16. The cartridge of claim 1, further including a low scatter window disposed over the second side of the flow through device.

17. The cartridge of claim 2, further including a cover with an opening positioned over the second side for passage of an optical signal therethrough.

18. The cartridge of claim 17, wherein the base, the chip holder, and the cover are constructed from a metal coated with a low light scattering coating.

19. The cartridge of claim 17, wherein the base, the chip holder, and the cover are injection molded as one piece.

20. The cartridge of claim 17, wherein the base is coupled to the cover with a fastener.

21. The cartridge of claim 20, wherein the fastener comprises a plurality of shoulder screws and spring washers, the base having complementary threaded portions for receiving threaded portions of the shoulder screws.

22. The cartridge of claim 20, wherein the fastener comprises a latch.

23. The cartridge of claim 22, wherein the cover and the base are hinged opposite the latch.

24. The cartridge of claim 1, wherein the body has a recess formed on an opposite side of the flow surface, wherein the recess forms a thermal chamber for controlling the temperature of the test fluid in the test fluid chamber.

25. The cartridge of claim 2, wherein the base has a recess for receiving the chip holder and the body has a recess formed on an opposite side of the flow surface, the recesses forming a thermal chamber for controlling the temperature of the test fluid in the test fluid chamber.

26. The cartridge of claim 25, further including an insert positioned in the recesses and defines the thermal chamber, the insert isolating the thermal fluid within the thermal chamber to prevent the test fluid from contamination.

27. The cartridge of claims 25, wherein the recess of the base is complementary to a low-end portion of the chip holder.

28. The cartridge of claim 26, further including means for distributing a thermal fluid into the thermal chamber.

29. The cartridge of any one of claim 1-28, wherein the flow through device is a FLOW-THRU-CHIP™.

30. The cartridge of any one of claims 1-28, further including a fluid delivery mechanism for delivering the test fluid mixture through the first port.

31. A chip holder for holding a flow through device having a first side, a second side, and an array of microchannel passages extending through the first and second sides, comprising:

a body with a support adapted to support the flow though device;

a flow surface formed within the body, the flow surface adapted to face the first side;

a test fluid chamber defined at least by the flow surface and the first side upon supporting the flow through device, and configured to produce a substantially uniform flow of a test fluid mixture through the microchannel passages; and

a first port communicating with the test fluid chamber for passing the test fluid mixture into the test fluid chamber.

32. The chip holder of claim 31, wherein the flow surface is angled.

33. The chip holder of claim 31, wherein the flow surface includes a trench that is sloped relative to the first side, from a first portion to a second portion of the flow surface, to provide a greater spacing at the first portion than at the second portion from the first side.

34. The chip holder of claim 33, wherein the first port is formed at the first portion and the trench has a slope of about 1° to about 4° relative to the first side.

35. The chip holder of claim 34, wherein the slope is about 2.55° relative to the first side.

36. The chip holder of claim 31, wherein the body has a second port for draining the test fluid mixture that has passed through the flow through device.

37. The chip holder of claim 31, wherein the support comprises a first shelf disposed around the flow surface, the support being adapted to seat a seal, which is adapted to be sandwiched between the first side and the first shelf.

38. The chip holder of claim 37, wherein the body has a second shelf disposed around the first shelf, the second shelf being adapted to seat an observation window.

39. The chip holder of claim 31, wherein the body has a recess formed on an opposite side of the flow surface, wherein the recess forms a thermal chamber for controlling the temperature of the test fluid in the test fluid chamber.

40. A system for performing hybridization assays, comprising:

a cartridge for housing a flow through device, comprising:

a flow through device having a first side, a second side, and an array of microchannel passages extending through the first and second sides; and

a chip holder for holding the flow through device, the chip holder comprising:

a body with a support that supports the flow though device;

a flow surface formed within the body, the flow surface facing the first side;

a test fluid chamber defined at least by the flow surface and the first side, and configured to produce a substantially uniform flow of a test fluid mixture through the microchannel passages; and

a first port communicating with the test fluid chamber for passing the test fluid mixture into the test fluid chamber; and

a fluidics station for delivering the test fluid mixture to the cartridge.

41. The system of claim 40, further comprising a temperature controller for controlling the temperature of the test fluid in the test fluid chamber.

42. The system of claim 40, wherein the fluidics station comprises:

a pump for moving fluid through a fluid path;

a buffer selection valve for controlling a passage of buffer solutions from buffer reservoirs;

a sample injection valve for controlling the passage of a target or probe compound into the fluid path to form the test fluid mixture; and

a re-circulation control valve in the fluid path and communicating with the buffer selection valve for controlling fluid flow, wherein the re-circulation valve is switchable between an open circuit mode and a closed circuit mode,

wherein in the open circuit mode, the pump communicates with one or more of the buffer solutions to direct the buffer solutions through the sample injection valve and the cartridge, and

wherein in the closed circuit mode, the pump flows the test fluid flow through the sample injection valve and the cartridge in a closed loop.

43. The system of claim 40, further comprising:

a system controller for monitoring and controlling fluid delivery, timing, and temperature of the system.

44. The system of claim 40, wherein the flow surface is angled.

45. The system of claim 40, wherein the flow surface includes a trench that is sloped relative to the first side, from a first portion to a second portion of the flow surface, to provide a greater spacing at the first portion than at the second portion from the first side.

46. The system of claim 45, wherein the first port is formed at the first portion and the trench has a slope of about 1° to about 4° relative to the first side.

47. The system of claim 46, wherein the slope is about 2.55° relative to the first side.

48. The system of claim 40, wherein the body has a second port for draining the test fluid mixture that has passed through the flow through device.

49. The system of claim 40, wherein the body has a recess formed on an opposite side of the flow surface, wherein the recess forms a thermal chamber for controlling the temperature of the test fluid in the test fluid chamber.

50. A method of performing a biomolecular assay, comprising:

controlling a passage of buffer solution from a buffer reservoir into the chip cartridge of any of claims 1-28;

controlling the passage of a target or probe compound into the buffer solution to form the test fluid mixture; and

circulating the test fluid mixture to the cartridge in a closed loop.

51. An apparatus for performing biomolecular assays, comprising the cartridge of any one of claims 1-28.

52. A system for performing biomolecular assays, comprising the cartridge of any one of claims 1-28.